

# **DC-8**

# **SEAC4RS Campaign**

# **Preparations**

29 April 2013

# Wingtip Pylons/Wing Structures Loads Assessment

- During DC3 instrument installations loads assessment OEM documentation discovered that described locations in the wing structure with low structural margins
  - Needed to understand implications of wing pylon instrument installations aero & inertia loads affect on these structural areas
- Review of OEM structural reports lacked needed details
  - Boeing contacted but were unable to help
- Dryden Structures Branch employed to assess this issue given known information
  - Resulted in assessing low structural margins areas sensitivity to various loads applied at the pylon
    - More than one approach used due to each case requiring assumptions to bridge existing holes in OEM wing structures data
  - One particular assessment approach looks most appropriate
    - And appears to suggest low sensitivity to affecting low structural margin areas
  - **High confidence that DC3 type pylon instrument installation will be approved**
    - Structures team is considering imposing small restrictions to airspeed envelop to contain aero loads to be within originally assessed pylon/sled/canister design
    - Mass of DC3 configuration is less than original pylon/sled/canister design
      - Assures that we are within inertia loads envelop
  - Next assessment (done in all cases) is to accomplish “ping” test of installed pylon/sled/ instrumentation to establish natural frequency of system
    - This will assure us that system is “stiff” enough to not be a flutter concern



# DC3 Lessons Learned Regarding Probe Clearance for Flight

- During DC3 instrument “shake” flight it was discovered that the PTRM & NOyO3 probes vibrated at various flight conditions
  - Anomaly discovered close to deployment date
  - All surprised since these probes had flown on the DC-8 before (but in different locations!!)
  - Caused delay in bringing these two instruments to full operation while the problem was determined, fix designed, materials procured, fabrication completed, probes installed, and second “shake” flight accomplished to clear modified probes
- Lesson learned is to fly as early as possible all probes new to DC-8 or existing probes that are flying new positions
  - Allows for time to solve any discovered issues
- See probe installation plan
  - Many will fly in June



## Instrument Integration Plan

### July 10 (Begin installing on aircraft):

DACOM/DLH/COLAS

APR-2

SPEC Probes (fitting and ping testing on wing)

PALMS

LARGE (may be installed during SARP)

DIAL

### July 12 (Begin installing on aircraft):

SAGA

AVOCET (already installed for SARP)

DFGAS

MMS

DASH-SP

HR-AMS

### July 15 (Begin installing on aircraft):

TD-LIF

CIT-CIMS

SPEC/MMS Rack

WAS (already installed for SARP)

### July 17 (Begin installing on aircraft):

PTR-MS

4STAR (already installed for SARP)

BBR

SSFR

CAFS

GT-CIMS

RPI

### July 23 (Begin installing on aircraft):

NOyO3

AOP

HD-SP2

ISAF

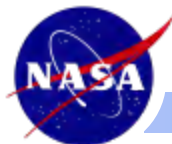
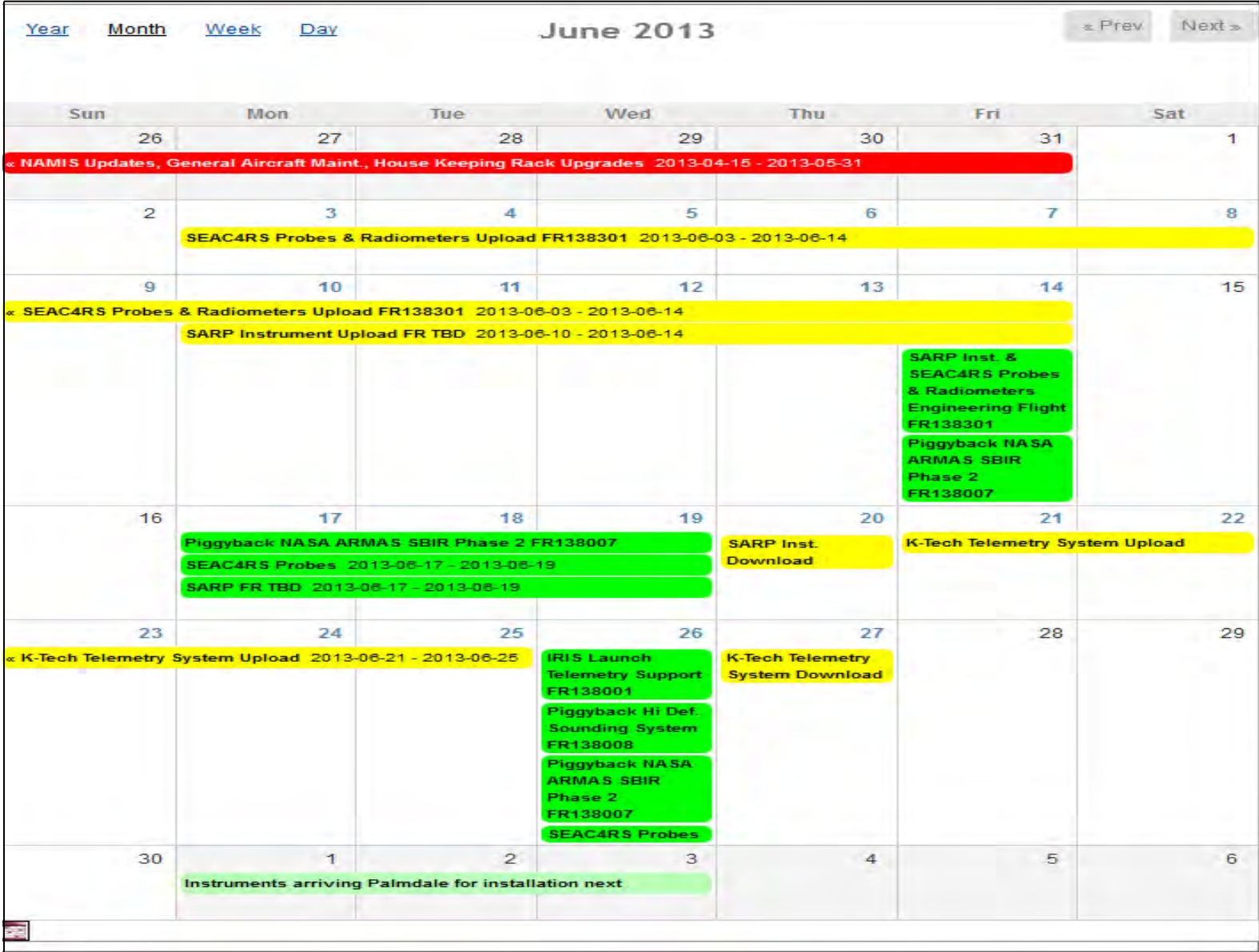


# SEAC4RS Probes Clearance Plan

Location	External Protrusion	Notes
FS330L	NOyO3 Inlet	Inlet not available in May-July
FS450L	DACOM Inlet	Available
FS570L	SAGA P-3 Inlet	Available
FS650L	AVOCET Inlet	Available
FS770L	DFGAS Inlet	Available
FS930L	PTR-MS Inlet	Available (plan to either borrow TOGA inlet and use DC3 inlet on P-3, or build a new inlet for P-3)
FS1090L	WAS Inlet	Available
FS1290L	1290L Exhaust Plate	Available
FS245R	MMS 858Y Alpha Probe	
FS490R	Clarkson Inlet (with new shroud)	Available (will have new shroud attached--differs from DC3 installation)
FS570R, FS610R	Clark Inlet	Available
FS770R	HD-SP2 Inlet	Inlet not available in May-July
FS850R	HR-AMS Inlet	Available
FS850R	ISAF Inlet	Available
FS930R	TD-LIF Inlet	Available (plan to fly streamlined tube inlet similar to Ryerson/Wisthaler, rather than DC3 inlet--we plan to preemptively incorporate vortex generator aerodynamic fix)
FS1010R	CIT-CIMS Inlet	Available
FS1090R	GT-CIMS Inlet	Available (streamlined tube inlet similar to Ryerson/Wisthaler--we plan to preemptively incorporate vortex generator aerodynamic fix)
FS1290R	1290R Exhaust Plate	Available
62° #1	SAGA Aerosol Inlets	Available
62° #3	Zenith Community Radiometer Plate	Available
	CAFS	Available
	SSFR	Available
	BBR	Available
62° #4	4STAR Sunphotometer	Available
Nadir #7	Nadir Community Radiometer Plate	Available
	CAFS	Available
	SSFR	Available
	BBR	Available
Nadir #5	SAGA Venturi Exhausts	Available
FS49L	MMS 102 TAT	
FS49 Nadir	MMS 102 TAT	
FS64R	MMS 851CU Pitot Probe	
Sextant Port	MMS 858Y Beta Probe	
FS430L (Giannini Port)	HR-AMS Venturi	Available
Left Wingtip Pylon	CPI, AIMMS-20 Probes	Did not ask PI regarding availability, waiting on some more resolution on wingtip pylon issues
Right Wingtip Pylon	HVPS, 2D-S, FCDP Probes	Did not ask PI regarding availability, waiting on some more resolution on wingtip pylon issues
	No changes since previously flown. Is available for June test flight.	
	No changes since previously flown. Not necessarily available but deemed not to have significant impact warranting a special checkout flight. Recommend just installing during main upload period.	
	New installation not previously flown on the DC-8. Is available for June test flight.	
	New installation not previously flown on the DC-8. Not available for June test flight.	



# DC-8 SEAC4RS 2013 Prep



# DC-8 SEAC4RS 2013 Prep

Year		Month		Week		Day		July 2013		« Prev		Next »	
Sun		Mon		Tue		Wed		Thu		Fri		Sat	
30		1		2		3		4		5		6	
		Instruments arriving Palmdale for installation next											
7		8		9		10		11		12		13	
SEAC4RS Upload FR138301 2013-07-08 - 2013-07-31													
						Begin Install of: DACOM/DLH /COLAS APR-2 SPEC Probes (fitting and ping testing on wing) PALMS LARGE DIAL				Begin Install of: SAGA AVOCET (already installed for SARP) DFGAS MMS DASH-SP HR-AMS			
14		15		16		17		18		19		20	
« SEAC4RS Upload FR138301 2013-07-08 - 2013-07-31													
		Begin Install of: TD-LIF CIT-CIMS SPEC/MMS Rack WAS (already installed for SARP)				Begin Install of: PTR-MS 4STAR (already installed for SARP) BBR SSFR (already installed for SARP) CAFS GT-CIMS RPI							
21		22		23		24		25		26		27	
« SEAC4RS Upload FR138301 2013-07-08 - 2013-07-31													
				Begin Install of: NOyO3 AOP HD-SP2 ISAF						DIAL Lidar Ground Calibrations			
28		29		30		31		1		2		3	
« DIAL Lidar Ground Calibrations 2013-07-26 - 2013-07-30						SEAC4RS Instrument Shake & Engineering Flights							
« SEAC4RS Upload FR138301 2013-07-08 - 2013-07-31													



# DC-8 SEAC4RS 2013 Prep

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August 2013

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Sun	Mon	Tue	Wed	Thu	Fri	Sat
28	29	30	31	1	2	3
« DIAL Lidar Ground Calibrations 2013-07-26 - 2013-07-30				SEAC4RS Instrument Shake & Engineering Flights		
« SEAC4RS Upload FR138301 2013-07-08 - 2013-07-31						
4	5	6	7	8	9	10
« SEAC4RS Instrument Shake & Engineering Flights				SEAC4RS Deployment CONUS (approx. dates) FR138301		
11	12	13	14	15	16	17
« SEAC4RS Deployment CONUS (approx. dates) FR138301 2013-08-08 - 2013-10-01						
18	19	20	21	22	23	24
« SEAC4RS Deployment CONUS (approx. dates) FR138301 2013-08-08 - 2013-10-01						
25	26	27	28	29	30	31
« SEAC4RS Deployment CONUS (approx. dates) FR138301 2013-08-08 - 2013-10-01						



## Miscellaneous Items

- Dryden Code O will start to use the requirements of NPR 1800.1C, “Occupational Health Program Procedures”, paragraph 2.15, “Shift Work and Balancing Work-Rest Cycles” for all local and deployed operations
  - 12 consecutive hours (16 consecutive hours in emergency situations with approval by a supervisor capable of evaluating the human factors risk level for the Critical role. Only during a Center or Program Declared Emergency may 16 consecutive hours be exceeded with high level of designated approval)
  - 60 hours during a 7 day work week\*
  - **Seven (7) consecutive days without at least 1 full day off\*(deviations may be pre-approved at a high level for up to 18 consecutive days with 2 full days off required after the extension period)**
    - (\*) denotes pre-approval is required for deviations by a designated supervisor after consideration of human factors safety issues for the Critical Position.
- DAOF Lab Usage
  - Arriving gas bottles need identification preferably name or instrument
  - All gas bottles on site need yellow tag (full / in use / empty) with Mission and Instrument noted
  - Storage is being provided for empty shipping boxes/crates (maximizes available lab space); See Karen for details
  - If you need to modify your lab space requirements see/call Karen
- DIAL Lidar FAA Clearance
  - John Hair assembled package for FAA assessment
  - I have contacted FAA and they are waiting more mission details in order to establish requirements in LNO



## Backup Info



## SPEC (DC3 Config.; may differ for SEAC4RS)

- Acquires high resolution images of cloud particles ranging in size from 1 micron to 1.92cm using laser-triggered CCD imaging and linear array shadowing
- PI: Paul Lawson, SPEC
- CPI and 2D-S have previously flown on the DC-8 during TC<sup>4</sup> and NAMMA
- Initial DC-8 flight for HVPS and FCDP—Have previously flown on the NASA WB-57, NASA Global Hawk, SPEC Learjet 25, and Thai BRRRAA King Air 350
- DC<sup>3</sup> Flight Information
  - Probes
    - HVPS, 2D-S, and FCDP probes on right wingtip pylon
    - CPI probe on left wingtip pylon (with AIMMS-20 probe)
  - Rack: FS840L High Rack shared with MMS
  - Power Requirements:
    - 115V, 60Hz: 800W
    - 115V, 400Hz: 3220W
    - 28VDC: 625W
- Structural Analysis/Review
  - Right Wingtip HVPS, 2D-S, and FCDP Installation
  - Left Wingtip CPI and AIMMS-20 Installation

